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STUDY ON FREQUENCY AND DURATION OF PERIPHERAL NEUROPATHY AMONG KNOWN CASE OF TYPE II DIABETES MELLITUS ≥ 30 YEARS IN CHIDAMBARAM URBAN POPULATION

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ABSTRACT

The foot ulcers among diabetic patients are mostly neuropathic origin and therefore eminently preventable. Sensory neuropathy increases the risk of foot ulcerations by seven folds and peripheral arterial disease (PAD) by three folds in people with diabetes. The Prevalence of peripheral neuropathy among diabetes is 26-33% as per the reported literature. To find out the frequency of Peripheral Neuropathy among Known Cases of Type II Diabetes Mellitus patients in Urban field practice area. To correlate Peripheral Neuropathy with select socio demographic variables. Descriptive cross sectional study was done among 316 known Type II Diabetic Mellitus patients in Urban field practice area under the Division of Community Medicine RMMCH. Basic socio demographic data were collected using a Pre-tested Questionnaire followed by a symptomatic history and Clinical Examination to rule out the peripheral neuropathy. Analysis was done using appropriate statistical methods like Pearson Chi square test. The Diabetic Peripheral Neuropathy was graded by using Toronto Clinical Scoring System. Grading of peripheral neuropathy as mild, moderate and severe. The prevalence of peripheral neuropathy among known cases of diabetic patients in this study was found to be 12.3%, mild, moderate and severe grading was observed as 4.71%, 2.53% and 5.06% respectively. Increased frequency of Diabetic peripheral neuropathy is observed above 60 years of age with significant statistical association. Diabetic peripheral neuropathy increases as duration of disease increases. Older adult patients should be screened for peripheral neuropathy continuously using simple instruments like monofilament and tuning fork because Neuropathy develops gradually.

Key words: Peripheral Neuropathy, Sensory loss, Monofilament.

INTRODUCTION

Diabetes Mellitus has reached epidemic proportions worldwide. Historically, diabetes was considered a disease confined to developed countries and affluent people. However, recent estimates suggest that the prevalence of diabetes is rising globally, particularly in developing countries [1]. Diabetes mellitus has become an important health concern in the South Asian region with an estimated increase in the prevalence of diabetes of over 15.1% between 2000 and 2030 [1].

India has more diabetics than any other country in the world, according to the International Diabetes Foundation [2], although more recent data suggest that China has even more [3]. The disease affects more than 62 million Indians, which is more than 7.1% of India's Adult Population [4] and is set to increase to over 100 million by 2030. An estimate shows that nearly 1 million Indians die due to Diabetes every year [2].

Neuropathy is considered the most common micro-vascular complications of both types I and II diabetes mellitus [5-6]. Neuropathic disorders in diabetes can impair functioning of the central, peripheral and autonomic nervous systems [7]. Distal peripheral neuropathy (DPN), also known as diabetic polyneuropathy affects the peripheral nervous system and is by far the most common type of neuropathy seen in Diabetes mellitus [8]. The resultant loss of function in peripheral nerves causes loss of protective sensations and impairs patient's ability to perceive incipient or even apparent ulcerations in the feet. Diabetic peripheral neuropathy is considered a main risk factor for amputation, and hence a significant cause of

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P a g e | 142

Asian J. Pharm. Res. Vol 4, Issue 3, 141-145, 2014.

morbidity in Diabetes mellitus [9]. Although a common and important complication of diabetes, neuropathy has not been studied as often or as extensively as macro-vascular complications or retinopathy and nephropathy [10]. In addition, the reported prevalence estimates vary widely between countries, in part due to the difference in sampling methods and lack of consensus on diagnostic criteria [11].

Increasing age, longer duration of diabetes and poor glycemic control are well recognized risk factors for DPN, while cigarette smoking, retinopathy, hypertension, obesity, hyperlipidemia and microalbuminuria have also been implicated as potential risk markers [12]. Most prevalence and risk factor studies are from western developed countries, while there is a relative scarcity of data from developing countries, particularly from the South-Asian region [13]. The South-Asian population in particular is known to have an increased predisposition for the disease [14]. In addition, several studies have demonstrated that the risk of diabetes related amputations and the prevalence of diabetic foot ulcers in UK is significantly lower in diabetic patients of Asian origin when compared to that of diabetic patients of European origin [15-16].

Semmes Weinstein monofilament (SWMF) examination and Diabetic Neuropathy Examination (DNE) scoring system which involve examination of fine touch, the application of the stimulus may be inconsistent, thus chances of possible Bias [17]. Hence, this population – based study was conducted to find out the frequency of peripheral neuropathy among type II diabetic individuals by using 10g Semmes Weinstein Monofilament Examination (SWMF) and Vibration test and its association with select socio demographic factors in the semi-urban community of Chidambaram, Tamil Nadu.

AIMS AND OBJECTIVES

1)To find out the frequency of Peripheral Neuropathy among Known Cases of Type II Diabetes Mellitus patients in Urban field practice area.

2) To correlate Peripheral Neuropathy with select socio demographic variables.

MATERIALS AND METHODS

Chidambaram, a municipality town in cuddalore district of Tamil Nadu is well known for its cultural heritage. This municipality comprises of 33 wards and 146 streets with a population of 82,458(2011 census).The Urban health centre under Division of Community Medicine, Rajah Muthiah Medical College has its service extended over four areas of Chidambaram Municipality namely old Bhuvanagiri, Manthakkarai , Omakkulam and Sengattan areas with a total of 23 streets comprising 12,525 population. The > 30 years of age population is 4,457. This is the urban field practice area, which is used for training and teaching medical students, interns and post graduates and also responsible for providing the preventive, promotive and curative health services in those areas.

Sample size was determined using a standard formula.

$$n = z^2 pq / d^2$$

z = confidence limit of 95% or 1.96,p = prevalence, q = 1-p,d = sampling error

Applying the above formula, the sample size required was 316, and it was calculated by keeping the prevalence as 29%, based on study done by Arindam Dutta *et al.,*[24] in Imphal , Manipur, in the year 2003.

Out of 23 streets in Urban field practice area, 16 streets were selected by simple random sampling. The first house from the first street of Old Bhuvanagiri area was taken as the starting point and subsequent houses were surveyed. 18 houses which were locked in between were left out and the adjacent houses were surveyed. When the sample size reached 316 the survey was stopped at 16th street (ie) middle house of Sengattan area. Ultimately total population surveyed was 7190, from 1747 households. Among 7190 population surveyed from 1747 households, 3619 (50.3%) were males and 3571(49.7%) were females.

The study was a Descriptive cross -sectional community based study. In the study population surveyed, 316 were found to be Known cases of type II Diabetes mellitus and they were included in this study .The study was carried out for a period of 10 months from October 2013 to July 2014. Study tool used were Pre tested proforma and Clinical examination. Data collection was done using a pre-tested structured interview schedule. Proforma was prepared in English and local language was used during interview to make it convenient for the population. Details about socio-demographic variables were collected. Further information was collected regarding duration of Diabetes mellitus, symptoms of sensory neuropathy. The Interview and Clinical examination were conducted by researcher himself, from known cases of Type II Diabetes after obtaining their informed consent from all the study subjects.

Ankle jerk was done after raising the lower limb on the bed, this procedure was done mostly for bed ridden and elderly subjects. A quick contraction of the calf muscle results in the normal individuals. This reflex was conveniently elicited when the patient was kneeling on a chair. In ambulant patients, Knee jerk was elicited with sitting up, the legs dangling freely over the edge of the bed. In bed ridden individual, knee jerk was elicited by keeping one hand below the knee of the patients, in lying position and with the other hand patellar tendon is struck with knee hammer. Cloths exposed above the knee to visualize quadriceps contraction. Finger nose test was performed with eyes closed; any additional irregularities indicates that there may be impairment of position sense in limb. Heel-knee test was done in lying supine on the bed, and subjects were advised to lift one leg straight up in the air, then to bend the knee and place the heel of his leg on the opposite knee and to slide the heel down towards the ankle. The study subjects were also asked to draw a large circle in the

P a g e | 143

Asian J. Pharm. Res. Vol 4, Issue 3, 141-145, 2014.

air with the toe. The circle drawn smoothly and accurately was recorded but in patients with the abnormality it is 'squared off' irregularly. Gait was analysed after the legs were adequately exposed and free of restricting clothing, with bare feet.

Touch sensation was performed using 10 G monofilament. The study subjects were asked to close the eyes and to indicate whether the touch is felt, and if it feels normal. Sensation reduced or absent, were recorded, and this was done on both upper and lower limbs. Patients responded to Vibration stimulus using Tuning fork 128 Hz placed on bony prominence such as dorsum of big toe, the lateral malleous and dorsum of finger. As it gradually fades in intensity, patients were advised to say when he or she ceases to feel it and if the researcher could still perceive it, it is interpreted that the patients perception of vibration is impaired. This is a valuable semi-quantitative test. Pain was tested by cutaneous stimulus with the help of light pin prick. The pins used were adequately sterile. Pressure pain

examined by squeezing a distal muscle of the Achilles tendon. Temperature sense was tested by using test tubes containing warm and cold water. The part to be tested is touched with each in turn, and the patient says whether each test tube feels hot or cold. The ability to discriminate between two points was done by using a pair of blunt dividers. The patient was asked whether one or both points can be felt(Two Point Discrimination). Normally 2 mm of separation of the points can be recognized as two separate stimuli on the finger tips and rather wider separation about 1 cm on the pulp of the toes.

Measurement and Grading of Peripheral Neuropathy

Diabetic Peripheral Neuropathy was graded by using Toronto Clinical Scoring System, as shown below. The result was expressed as a range with a minimum of 0 to a maximum of 19 points.6 points are derived from symptoms, 8 from lower-limb reflexes and 5 from sensory examination distally at the toes.

Present = 1 Absent = 0	Absent = 2 Reduced = 1 Normal = 0	Abnormal = 1 Normal = 0

SYMPTOMS	REFLEXES	SENSORY TEST
Foot-Pain, Numbness, Tingling, Weakness Ataxia, Upper limb symptoms such as Tremor	Knee reflex, Ankle reflex	Pinprick, Temperature, Light touch, Vibration ,Position Sensory testing

Total scores range from 0 to maximum of 19.
Scoring:
No neuropathy; 0-5points,
Mild neuropathy; 6-8points,
Moderate neuropathy; 9-11points,
Severe neuropathy; 12-19points

Data Analysis

Data collected was entered in Microsoft 2007 excel spread sheet, compiled and analysed using IBM SPSS Version 18 statistical package. Statistical analysis included descriptive statistics, Pearson chi-square test was performed to find out association between peripheral neuropathy and select socio demographic variables.

RESULTS

The Diabetic Peripheral Neuropathy was graded by using Toronto Clinical Scoring System. Grading of peripheral neuropathy as mild, moderate and severe. The prevalence of peripheral neuropathy among known cases of diabetic patients in this study was found to be 12.3%, mild, moderate and severe grading was observed as 4.71%, 2.53% and 5.06% respectively from 316 patients. Increased frequency of Diabetic peripheral neuropathy is observed above 60 years of age with significant statistical association. Diabetic peripheral neuropathy increases as duration of disease increases, out of 316, 66.6% had diabetes for 1-10 years and 30.7% for last 11-20 years. This association is statistically significant.

Table 1. Toronto Clinical Scoring for Diabetic Peripheral Neuropathy

Toronto clinical scoring for peripheral neuropathy		N	%
0-5	No neuropathy	277	87.70
6-8	Mild neuropathy	15	4.71
9-11	Moderate neuropathy	8	2.53
12-19	Severe neuropathy	16	5.06
Total		316	100

As per Toronto Clinical Scoring, 12.3% of the study subjects are having diabetic peripheral neuropathy.

Table 2. Distribution of Diabetic Peripheral Neuropathy According to Age Group

Age group	Diabetic neuropathy		Total
	Present	**Absent**	
30-39	0(0%)	29(10.5%)	29(9.2%)
40-49	7(18.0%)	69(25.0%)	76(24%)
50-59	5(12.8%)	91(32.8%)	96(30.4%)
60-69	13(33.3%)	61(22.0%)	74(23.4%)
>60	14(35.9%)	27(9.7%)	41(13.0%)
Total	39(100%)	277(100%)	316(100%)

$X^2 = 29.17$: P-value=0.000. Increased frequency of Diabetic peripheral neuropathy is observed among higher age groups >60 years and it is statistically significant.

Table 3. Association between duration of Disease and Diabetic Peripheral Neuropathy

Duration in years	Diabetic peripheral neuropathy		X^2	p-value
	Present	**Absent**		
<1	0	27		
1-10	26	226	25.759	0.000
11-20	12	22		
21-30	1	2		

Diabetic peripheral neuropathy increases as the duration of disease increases and it is statistically significant.

DISCUSSION

Diabetic Peripheral Neuropathy was graded by using Toronto Clinical Scoring System. The results were expressed as a range with a minimum of 0 to a maximum of 19 points. Grading of peripheral neuropathy is Classified as mild, moderate and severe. No neuropathy 0-5points, Mild neuropathy 6-8points, Moderate neuropathy 9-11points, Severe neuropathy 12-19points. The prevalence of peripheral neuropathy among known cases of diabetic patients in this study was found to be 12.3%, mild, moderate and severe grading was observed as 4.71%, 2.53% and 5.06% respectively. Similar scoring scale was by used Mark Davis *et al.,* [18] in urban community at south Wales of united kingdom According to Mark Davis *et al.,* [18] over all prevalence of Diabetic Peripheral Neuropathy was 26.4% and Prasad Katulanda *et al.,* [19] had randomly selected 100 clusters of 50 adults each and Diabetic neuropathy was diagnosed by both Diabetic neuropathy symptom Score(DNS) and Toronto Clinical Scoring System(TCSS) among them. Out of 5000 invited subjects, 4477 number of participants participated in the study. Prevalence of Diabetic peripheral neuropathy according to DNS Score was 48.1%.

In the current study, increased frequency of Diabetic peripheral neuropathy is observed above 60 years of age with significant statistical association.(refer Table no 27 ; P-value = 0.000) Other studies done by Hanu George *et al.,* [20] and kjersti Morkrid *et al.,* [21] shows similar results. Jambart *et al.,* [21] conducted the study in patients attending out patients clinic across Middle East and majority of neuropathy was more found above 65 years of age which is more similar to present study.

In this study Diabetic peripheral neuropathy increases as duration of disease. Increases, out of 316,

66.6% had diabetes for 1-10 years and 30.7% for last 11-20 years. This association is statistically significant. (refer Table no; 29 ; P-value = 0.000) Kjersti Morkrid *et al.,* [22] survey reported 27.8% had Diabetic peripheral neuropathy those having 9-11 years duration of Diabetes. Other studies done by Nielsen *et al.,* [23], Khaled Kasim *et al.,* [24] and S Ashok *et al.,* [25] also showed the similar association between diabetic peripheral neuropathy and duration of disease, this is due to longer duration and uncontrolled blood sugar, which damages kidneys which increases toxins in blood and contribute to nerve damage.

CONCLUSION AND RECOMMENDATION

The prevalence of peripheral Neuropathy among patients with diabetes in current study was high in older age and longer the duration of diabetes. Older adult patients should be screened for peripheral neuropathy continuously using simple instruments like monofilament and tuning fork because Neuropathy develops gradually. Touch sensation impairment seen because sensory system affected predominately so the clinical test is important. Patients with Diabetic peripheral neuropathy with or without corns / callous as a tertiary prevention advised to wear MCR / MCP foot wear.

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